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Depression Symptoms Associated with Cannabis Dependence in an Adolescent American Indian Community Sample

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Abstract

Background—Depression and substance use disorders, including cannabis dependence, arise during adolescence, are frequently co-morbid, and represent major health burdens in the general U.S. population. Yet little is known about the association of depression symptoms with cannabis and other substance use and use disorders in Native American adolescents.

Objective—To investigate the comorbidity of cannabis use and depression symptoms in Native American adolescents.

Methods—This study used the Children's Semi-Structured Assessment for the Genetics of Alcoholism (Adolescent Version) to obtain lifetime DSM-III-R diagnoses from a community sample of 202 (98 boys, 104 girls) American Indian adolescents living on contiguous reservations.

Results—Thirteen percent of boys and 38% of girls had a lifetime DSM-III-R major depression disorder (MDD) independent of substance use. Fifteen percent of boys and 41% of girls had a major depression episode (MDE) either coincident with or independent of cannabis use. MDE and several individual depression symptoms were significantly associated with cannabis dependence in boys but not in girls. The median ages of onset of MDE were the same in the boys and girls who had experienced both depression and cannabis use.

Conclusions—These findings suggest that the association of depression with cannabis dependence is more significant in boys than girls in this population of adolescents.

Scientific Significance—Understanding co-morbidity between depression and cannabis use is important in order to disentangle the etiological relationship between the two and also for designing more effective treatment and prevention strategies, particularly in Native Americans who are at high risk for both disorders.

INTRODUCTION

Native American adolescents have the highest rates of depression syndrome and major depression episode (MDE) of any U.S. ethnic adolescent population.^{1–6} In the 2006 NSDUH survey,² DSM-IV MDE occurred at a rate of 9.3% in Native American 12 – 17 year olds. Additionally, the 2006 – 2007 NSDUH survey⁶ found a rate of 11% for alcohol and illicit substance abuse and dependence in Native American youth aged 12 - 17 years, higher than other U.S. ethnic groups. In 2003, suicide rates for Native American youth were reported to

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be 3.7 and 3.5 times higher than U.S. all races for 5 – 14 year olds and 15 – 24 year olds, respectively.⁷ In 2003, alcohol-related death rates of Native American youth aged 5 - 24 years alcohol and drug related deaths were 1.4 – 13.3 times higher as compared to U.S. all races age groups.^{8,9}

In non-Native adolescent samples, cannabis use and use disorders are substantially co-morbid with depression.¹⁰⁻¹² For instance, Costello and colleagues¹⁰ found a significant association between DSM-III-R cannabis, tobacco, alcohol, and other drug use and “any substance use disorder” with major depression disorder in adolescent boys. Similar findings have been reported in adolescent samples collected in Australia,¹³ New Zealand,¹⁴ and Canada.¹⁵ Novins and Mitchell¹⁶ found that high frequency (≥ 11 times), but not low frequency (1-3 times), past month cannabis use was associated depression symptoms in American Indian boys in univariate analyses. To our knowledge, no other studies have examined samples of Native American adolescents for co-morbidity of depression symptoms with cannabis use and dependence.

The overall goal of this study was to assess the temporal relationship between lifetime depression symptoms and MDE (depression symptoms/MDE) and cannabis use and dependence in a community sample of American Indian adolescents. The goal was accomplished through three specific aims. The first aim was to determine the rates of individual depression symptoms, MDE, and cannabis and other substance dependence disorders based on gender in this American Indian community sample. The second aim sought to estimate the co-morbidity of depression symptoms and MDE (depression symptoms/MDE) and cannabis dependence in boys and girls taking into consideration potentially confounding covariates. The third aim of this study was to assess the temporal relationship between the onset of individual depression symptoms/MDE and first use of cannabis in the subgroups of participants who had experienced both the symptom/MDE and had used cannabis in their lifetimes.

METHODS

Participants

Participants in this study consisted of 98 boys and 104 girls aged 13 – 17 years recruited from eight geographically contiguous Southwest California American Indian reservations with a total population of about 3,000 individuals. Parents (or legal guardians) of potential participants were informed of the study using a combination of a venue-based method for sampling hard-to-reach populations¹⁷⁻¹⁸ as well as a respondent-driven procedure.¹⁹

In discussion with tribal recruitment coordinator or the study coordinator at the research facility, parents (or legal guardians) of potential participants were given a brief description of the study, told transportation would be provided, and informed as to the amount their adolescent would be paid for participation. The tribal recruitment coordinator and/or the study coordinator at the research facility explained the study to the adolescent. Informed consent and assent were obtained from the parent and adolescent, respectively, prior to initiating the study. Transportation from home to The Scripps Research Institute was provided by the study.

To be included in the study, participants had to be living on or near the eight reservations, at least 1/16th Native American Heritage, aged of 13 – 17 years, and able to be transported from his or her home to The Scripps Research Institute (TSRI). The protocol for the study was approved by the Institutional Review Board of TSRI, and the Indian Health Council, a tribal review group overseeing health issues for the reservations where recruitment was undertaken.

Measures

Each participant completed an interview with the Children's Semi-Structured Assessment for the Genetics of Alcoholism: Adolescent Version (C-SSAGA-A) for adolescents aged 13 – 17 years.²⁰ The C-SSAGA-A collects demographic and lifetime substance use information as well as lifetime substance use disorder and psychiatric disorder symptoms and diagnoses according to DSM-III-R criteria.²⁰⁻²² Each C-SSAGA-A was reviewed by and all best final diagnoses were made by a research psychiatrist/addiction specialist (DAG).

The C-SSAGA-A assesses the nine DSM-III-R MDE Criterion A symptoms during at least four lifetime depression episodes whether or not a depression episode meets criteria for a MDE or is associated temporally with substance use, a medication, a psychosocial stressor, bereavement, or medical problem. The C-SSAGA-A also assesses the age of onset and duration of the depression symptoms and episodes. For the purposes of this study, individual depression symptoms were considered if they had lasted for two weeks or more. MDE was diagnosed if the adolescent had a lifetime history of one or more depression episodes with five or more Criterion A depression symptoms with a duration of two weeks or more whatever the presumed etiology of the depression with three exceptions. Adjustment reactions with depressed mood which met Criteria A at two weeks and bereavements which met Criterion A at six months were considered a MDE. Depression episodes due to the direct physiological effects of a general medical condition were not diagnosed as a MDE and not included in this analysis. A diagnosis of major depression disorder (MDD) was made if the participant met the previously stated criteria for MDE and that MDE was considered not to be related to substance intoxication or withdrawal.

Diagnoses of lifetime cannabis, cocaine, or amphetamine dependence or heavy substance use were considered only if an adolescent had used cannabis, cocaine, or amphetamine, respectively, more than 6 times in his/her life. A diagnosis of lifetime alcohol dependence or heavy alcohol use was considered only if the adolescent had drunk more than six standard drinks in his/her life. A heavy substance use criterion for the substance use was considered positive if the adolescent had used the substance every day or nearly every day for two weeks or more at least once in his/her life. Age of first use of each drug and age of first intoxication with alcohol (defined as "you couldn't talk clearly and it was hard to keep your balance") were recorded. A combined heavy substance use criterion was considered positive if the adolescent had used one or more substance every day or nearly every day for at least two weeks at least once in his/her lifetime. A combined early age of first use was considered positive if the adolescent had first used a drug or been intoxicated with alcohol prior to age 13 years. A diagnosis of early conduct disorder was considered positive if the participant met DSM-III-R criteria for conduct disorder prior to the age of 13 years.

Data Analysis

To implement the three aims of the study, three sets of data analysis were undertaken. These analyses were carried out for boys and girls separately. The first set of analyses determined the frequencies of each depression symptom; MDE; cannabis, alcohol, and stimulant dependence; heavy substance use; early substance use; and early conduct disorder including "subthreshold" depression syndromes.²³⁻²⁶ Depression symptoms occur in a variety of depression syndromes other than major depression disorder. Considering only depression syndromes that are part of a formal major depression disorder unnecessarily limits the scope of depression symptoms under study and may miss important co-morbidity between depression and cannabis. In addition, specific individual depression symptoms may be associated with cannabis and represent a cannabis-associated depression syndrome. One such syndrome that has been posited is the "amotivational syndrome." But whether such a syndrome as a unique group of depression symptoms associated with cannabis exists is

unclear.²⁷ Frequencies of these disorders and variables in boys and girls were compared using 2X2 contingency tables. Fisher two-tailed p-values were calculated for each comparison.

The second set of analyses was undertaken to assess co-morbidity of each depression symptom/MDE with: (1) each substance dependence diagnosis, (2) the heavy substance use criterion, (3) the early substance use criterion, and (4) early conduct disorder, using two kinds of analysis. First, the odds ratios and 95% confidence intervals were calculated, and 2X2 contingency tables and Fisher two-tailed p-values for each comparison were calculated. Second, multivariate logistic regression was used to assess the association of each depression symptom/MDE (as the outcome variable) with the following independent variables: age, gender, cannabis dependence, alcohol dependence, heavy substance use, early substance use, and early conduct disorder using the Backward Stepwise approach of Wald (SPSS, version 16, Scientific Software International). Independent variables with the highest p-value (>0.10) were removed in each step. Stimulant dependence was not included in the logistic regression analyses because of the low number of participants with that diagnosis (1 boy and 6 girls).

The third set of analyses sought to investigate the temporal relationship between the emergence of depression symptoms and cannabis use in participants who had experienced at least one lifetime depression symptom and had used cannabis at least once in their lives. First, for each depression symptom/MDE, the numbers of participants who experienced the onset of the depression symptom/MDE at the same age or after their first use of cannabis (as opposed to before their first use of cannabis) and the total number of participants who had experienced the depression symptom/MDE and had used cannabis at least once in their lives was determined for boys and girls. These proportions in boys and girls were compared using 2X2 contingency tables. Fisher two-tailed p-values were calculated for each comparison. Second, ages of onset of each depression symptom/MDE and age of first use of cannabis were compared in boys and girls using the Mann-Whitney test for non-normally distributed data. Third, ages of onset of each depression symptom/MDE and age of first use of cannabis were compared in boys and separately in girls using the Mann-Whitney test for non-normally distributed data. In all three sets of data analysis, the alpha level was set at 0.05 and p-values were considered significant if < 0.05 .

RESULTS

In this sample of 202 American Indian adolescents (98 boys, 104 girls), the median age was 15.0 years. All participants self-identified as Native American. All spoke English as their primary language. Ninety-five percent were currently in school. There were no significant differences in age, ethnicity, primary language, or the number currently in school when boys and girls were compared, using the Mann-Whitney test for continuous data and Fisher Exact tests for categorical data.

A high rate of lifetime MDE was found in this community sample. Fifteen percent of boys and 41% of girls met DSM-III-R criteria for MDE. Additionally, high rates of lifetime depression symptoms were seen in this population. Thirty-six percent of boys and 65% of girls had one or more depression symptoms, and 27% of boys and 55% of girls had three or more depression symptoms. Table 1 shows the frequencies of each depression symptom and MDE in boys and girls separately. Depressed mood (32% of boys; 63% of girls) and anhedonia (22% of boys; 56% of girls) were the first and second most frequent depression symptoms in both boys and girls. Lifetime rates of MDD, considered as MDE not related to substance intoxication or withdrawal, were also high. Thirteen percent of boys and 38% of

girls experienced a MDD. All depression symptoms, MDE, and MDD were significantly more frequent in girls compared to boys.

Sixteen percent of boys and 24% of girls met DSM-III-R criteria for cannabis dependence. The rates of DSM-III-R alcohol and stimulant dependence; heavy substance use; early substance use; and DSM-III-R early conduct disorder are also presented in table 1. None of these were significantly more or less frequent in boys as compared to girls.

In order to assess the co-morbidity of depression and cannabis dependence, odds ratios, 95% CIs, and 2-sided Fisher p-values using 2X2 contingency tables were calculated for each depression symptom, MDE, and MDD in groups of adolescents with and without cannabis dependence. As seen in table 2, depressed mood, anhedonia, psychomotor agitation/retardation, feelings of worthlessness/guilt, diminished concentration/indecisiveness, and MDE were all significantly more frequent in the cannabis dependent group in boys, but not in girls. MDD, however, was not more frequent in the cannabis dependent vs. the non-cannabis dependent group in either boys or girls.

The same analytic approach was used to determine if the same relationships would be seen between depression symptoms/MDE/MDD and alcohol and stimulant dependence. No individual depression symptom, MDE, or MDD was found to be co-morbid with either alcohol or stimulant dependence in boys or girls. However, because only one boy met criteria for lifetime stimulant dependence odds ratios for depression in stimulant dependent vs. non-dependent boys could not be calculated reliably. Similarly, the relationship between early and heavy substance use and early conduct disorder and depression symptoms/MDE/MDD was estimated. Odds ratios, 95% CIs, and 2-sided Fisher p-values were calculated for each depression symptom, MDE, and MDD in groups with and without heavy substance use; early substance use; and early conduct disorder. No depression symptom, or MDE, or MDD was significantly more common in the affected groups for boys or girls.

Table 3 shows the results of logistic regression analyses that were conducted to determine the potential interrelationships between depression and cannabis dependence taking into consideration other modifying variables. In these analyses, each depression symptom/MDE/MDD was used as the dependent variable with age, gender, cannabis dependence, alcohol dependence, heavy substance use, early substance use, and early conduct disorder as the independent variables, for boys and girls separately. Odds ratios and p-values for each independent variable in each final logistic regression model are shown. In boys, the depression symptoms of: depressed mood, anhedonia, psychomotor agitation/retardation, feelings of worthlessness/guilt, poor concentration/indecisiveness, were significantly associated with cannabis dependence in the final logistic models. MDE was also significantly associated in the final logistic model with cannabis dependence in boys, but MDD was not.

In contrast, neither cannabis dependence nor alcohol dependence remained in the final logistic models in girls for any depression symptom, MDE, or MDD. However, in girls a few relationships emerged between depression symptoms and increasing age, early substance use, heavy substance use, and early conduct disorder. Early substance use was significantly associated with a diminished likelihood of having feelings of worthlessness/guilt, whereas, heavy substance use was significantly associated with an increased likelihood of feelings of worthlessness/guilt. Increasing age was also significantly associated in the final logistic models in girls with increasing likelihood of diminished mood, anhedonia, diminished energy, and MDE.

The third set of analyses sought to investigate the temporal relationship between the emergence of depression and cannabis use in participants who had experienced at least one

lifetime depression symptom and had used cannabis at least once in their lives. The percentage of boys who experienced the onset of the depression symptom at the same age or after the first use of cannabis ranged from 25% (suicidal ideation/attempt) and 50% (sleep change) to 73% (depressed mood). The result for suicidal ideation/attempt is considered unreliable because of the low number of boys (four) with suicidal ideation/attempt. The percentage of girls who experienced the onset of the depression symptom at the same age or after the first use of cannabis ranged from 50% (psychomotor agitation/retardation) to 63% (anhedonia). Sixty-two percent of boys and 67% of girls experienced the onset of their first MDE at the same age or after their first use of cannabis. Comparing these proportions for each depression symptom and MDE in boys vs. girls revealed no significant differences.

Further, the median ages of onset of each depression symptom and MDE and first use of cannabis were calculated and then compared in boys and girls. Median ages of onset of depression symptoms ranged from 9.5 years for suicidal ideation/attempt in boys to 13.4 years for anhedonia in girls. Median age of onset of MDE was 12.9 years in boys and 13.7 years in girls. One depression symptom, suicidal ideation/attempt, occurred significantly earlier in boys (median age = 9.5 years) than in girls (median age = 13.3 years, $p = 0.03$), but this result is considered unreliable because of the low number of boys (four) with suicidal ideation/attempt. Otherwise, no depression symptom or MDE occurred earlier in boys as compared to girls. Median ages of first use of cannabis were significantly earlier in boys than girls for depressed mood (median age = 11.9 years in boys) (median age = 13.0 years in girls; $p = 0.04$) and feelings of worthlessness/guilt (median age = 11.4 years in boys) (median age = 13.0 years in girls; $p = 0.04$), but not for other symptoms or for MDE.

DISCUSSION

In this American Indian community adolescent sample, a high rate of depression symptoms and MDE was found. Fifteen percent of boys and 43% of girls reported having MDE. These rates of MDE are comparable to rates reported in a group of 141 American Indian adolescents¹ and higher than those reported for predominantly EuroAmerican adolescent samples.^{1,2,11,12,28-33} Overall, these findings underscore the high burden of both depression and substance use and use disorders carried by Native American adolescents of both genders. However, the fact that cannabis dependence, but not alcohol dependence, heavy substance use or conduct disorder, is associated with depression symptoms and MDE in boys but not in girls is consistent with the notion that this is a specific effect of cannabis and that boys may be more at risk than girls.

The findings of this study also indicate that depression and cannabis use in both boys and girls “co-emerge” in late childhood and early adolescence. One interpretation of this temporal relationship of depression symptoms and substance use is the general hypothesis that repeated use of substances may activate brain areas associated with the generation of depression symptomatology.³⁴⁻³⁵ Using this model and extending it to adolescents one would predict that adolescents would initially be attracted to substances for their hedonic potential but will ultimately develop depression symptoms as a result of repeated use. Those depression symptoms themselves would then drive further substance use if the user believes that the use of the substance will, at least temporarily, enhance hedonia and/or reduce depression symptoms. This model, in which depression symptoms and substance use would have a mutually reinforcing circular evolution, has been posited previously.^{24,36} The data obtained in the present study support this hypothesis.

In the context of the present study, we found that in boys the specific individual depression symptoms associated with cannabis dependence were: depressed mood, anhedonia, psychomotor agitation/retardation, feelings of worthlessness/guilt, and diminished

concentration/indecisiveness. This constellation of symptoms may represent a distinct cannabis associated depression syndrome in boys. To our knowledge, specific depression syndromes in adolescents that are gender specific have not been assessed in previous studies. Although controversial and difficult to demonstrate,²⁷ this depression syndrome may represent the amotivational syndrome ascribed to cannabis use in the literature. If so, this amotivational depression syndrome in this sample occurs in boys but not in girls.

Explanations for the specific association of depression symptoms and disorder with cannabis dependence in boys but not in girls could, in theory, involve any psychosocial or biological gender difference. One biological explanation may be that cannabis induces neurochemical changes in the adolescent male brain which makes it more vulnerable to depression symptoms because of the presence of male sex hormones. Although controversial, several studies have demonstrated that cannabis use can lower testosterone levels, especially following prolonged daily use.³⁷ The results of research on the relationship between testosterone levels and mood are not entirely consistent. However, there appear to be subpopulations where hypogonadism contributes to depression, and chronic depression illness may lead to hypogonadism.³⁸ There also appear to be important gender differences in the effects of cannabis on sexual behavior and gonadal hormone function (see Gorzalka and Hill³⁹ for a review). Additionally, data from preclinical and clinical studies increasingly points to a role for the endogenous endocannabinoids in stress adaptation and the etiology of depression symptoms.⁴⁰⁻⁴³ Cannabis use in adolescence may promote depression symptoms by changing the sensitivity of endogenous endocannabinoid mediation of the hypothalamic-pituitary-adrenal axis or central corticotropin-releasing factor mediated stress system function. A third type of mechanism would be that both depression and cannabis dependence arise separately from a third factor, such as a common genetic risk⁴⁴ or historical trauma that affects boys more than girls.

In conclusion, these results confirm that Native American boys and girls carry a heavy burden of depression and substance dependence and that boys may suffer from an association between depression and cannabis more than girls. It also appears that depression and cannabis use arise together in adolescence in this population of Native Americans. It should be noted that our findings may not be representative of the tribes from which the study sample was drawn and the results of this study may not generalize to other American Indian groups or all Native American adolescents. However, the findings of this study may help in the development of culturally sensitive and effective intervention and prevention programs for this high risk group.

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Table 1

Frequencies of lifetime DSM-III-R depression symptoms, major depression episode (MDE), major depression disorder (MDD), substance dependence, and early conduct disorders; and heavy substance use and early substance use variables in boys (n=98) and girls (n=104) in an American Indian adolescent community sample.

Variable	Boys n (%)	Girls n (%)	Fisher p-value*
Depressed Mood	31 (32)	66 (63)	<0.001
Anhedonia	22 (22)	58 (56)	<0.001
Weight Change	16 (16)	32 (31)	0.020
Sleep Change	24 (24)	52 (50)	<0.001
Psychomotor	20 (20)	48 (46)	<0.001
Loss of Energy	16 (16)	46 (44)	<0.001
Worthless/Guilty	15 (15)	43 (41)	<0.001
Poor Concentration	22 (22)	50 (48)	<0.001
Suicide	7 (7)	43 (41)	<0.001
Major Depression Episode (MDE)	15 (15)	43 (41)	<0.001
Major Depression Disorder (MDD)	13 (13)	40 (38)	<0.001
Cannabis Dependence	16 (16)	25 (24)	0.221
Alcohol Dependence	14 (14)	17 (16)	0.701
Stimulant Dependence	1 (1)	6 (6)	0.120
Heavy Substance Use	23 (23)	24 (23)	0.540
Early Substance Use	32 (33)	32 (31)	0.446
Early Conduct Disorder (before age 13 years)	19 (19)	14 (13)	0.172

Major Depression Episode (MDE) was defined as having 5 DSM-III-R major depression symptoms for 2 weeks (Criterion A of DSM-III-R Major Depression Episode) irrespective of the presumed etiology of the depression episode. Major Depression Disorder (MDD) was defined as having an MDE not related to substance intoxication or withdrawal. Heavy Substance Use was defined as using cannabis, alcohol, and/or a stimulant every day or nearly every day for 2 weeks. Early Substance Use was defined as first use of cannabis or a stimulant or having been first intoxicated with alcohol prior to age 13 years. Early Conduct Disorder was defined as meeting DSM-III-R criteria for Conduct Disorder prior to age 13 years.

* Frequencies of each variable in boys and girls were compared using 2X2 contingency tables. Fisher two-tailed p-values were calculated for each comparison. Alpha was set at 0.05, and p-values < 0.05 were considered significant.

Table 2

Co-morbidity of lifetime DSM-III-R depression symptoms, MDE, and MDD with lifetime cannabis dependence in American Indian adolescents (Boys n=98; Girls n=104).

Depression Symptom or MDE	Cannabis Dep n (%)	Non-Cannabis Dep n (%)	Odds Ratio	95% CI	Fisher p-value
Depressed Mood					
Boys	9 (56)	22 (27)	3.51	1.16 - 10.55	0.037
Girls	19 (76)	47 (59)	2.16	0.78 - 5.99	0.159
Anhedonia					
Boys	7 (44)	15 (18)	3.47	1.12 - 10.81	0.045
Girls	17 (68)	41 (52)	1.97	0.76 - 5.09	0.174
Weight Change					
Boys	5 (31)	11 (13)	2.93	0.85 - 10.07	0.313
Girls	9 (36)	23 (29)	1.37	0.53 - 3.54	0.620
Sleep Change					
Boys	7 (44)	17 (21)	2.97	0.97 - 9.14	0.062
Girls	16, 64	36 (46)	2.12	0.84 - 5.38	0.168
Psychomotor					
Boys	8 (50)	12 (15)	5.83	1.84 - 18.53	0.004
Girls	11 (44)	37 (47)	0.89	0.36 - 2.20	0.823
Loss of Energy					
Boys	5 (31)	11 (13)	2.93	0.85 - 10.07	0.131
Girls	14 (56)	32 (41)	1.87	0.75 - 4.64	0.248
Worthless/Guilty					
Boys	6 (38)	9 (11)	4.87	1.43 - 16.59	0.015
Girls	13 (52)	30 (38)	1.77	0.71 - 4.38	0.249
Poor Concentration					
Boys	7 (44)	15 (18)	3.47	1.12 - 10.81	0.033
Girls	15 (60)	35 (44)	1.89	0.76 - 4.71	0.251
Suicide					
Boys	2 (13)	5 (6)	2.20	0.39 - 12.48	0.320

Depression Symptom or MDE	Cannabis Dep n (%)	Non-Cannabis Dep n (%)	Odds Ratio	95% CI	Fisher p-value
Girls	12 (48)	31 (39)	1.43	0.58 - 3.53	0.489
Major Depression Episode (MDE)					
Boys	6 (38)	9 (11)	4.87	1.43 - 16.59	0.015
Girls	13 (52)	30 (38)	1.77	0.71 - 4.38	0.249
Major Depression Disorder (MDD)					
Boys	4 (25)	9 (11)	0.370	0.10 - 1.39	0.218
Girls	10 (40)	30 (38)	0.920	0.37 - 2.30	1.000

The rows represent each depression symptom, MDE, and MDD in the cannabis dependent (Cannabis Dep) and non-cannabis dependent (Non-Cannabis Dep) group in boys and girls separately. Odds ratios and 95% confidence intervals (95% CI) were calculated for each symptom, MDE, and MDD by comparing the odds of the symptom/MDE/MDD in the cannabis dependent group with the odds of the symptom/MDE/MDD in the non-cannabis dependent group. Fisher p-values were calculated from 2X2 contingency tables comparing the number of participants with each symptom/MDE/MDD in the cannabis dependent versus the non-cannabis dependent groups. Alpha was set at 0.05, and p-values < 0.05 were considered significant. Both analyses were applied to boys and girls separately.

Table 3

Final logistic regression models for factors associated with lifetime DSM-III-R depression symptoms, MDE, and MDD for boys (n=98) and girls (n=104).

Outcome Variable	Boys			Girls		
	Factor*	Odds Ratio	p-value	Factor*	Odds Ratio	p-value
Depressed Mood	MJ Dep	3.506	0.026	Age	1.475	0.014
Anhedonia	MJ Dep	3.474	0.032	Age	1.440	0.016
Weight Change	MJ Dep	2.934	0.087	None		
Sleep Change	Age	1.407	0.054			
	MJ Dep	2.925	0.068	None		
Psychomotor	MJ Dep	5.833	0.003	None		
Loss of Energy	MJ Dep	2.934	0.087	Age	1.397	0.025
Worthless/Guilty				Early use	0.295	0.030
	MJ Dep	4.867	0.011	Heavy use	3.711	0.026
Poor Concentration	MJ Dep	3.474	0.032	None		
Suicide				Early use	0.436	0.083
	Age	2.048	0.052	CD	3.73	0.037
Major Depression Episode (MDE)	Age	1.477	0.079			
	MJ Dep	4.856	0.014	Age	1.395	0.027
Major Depression Disorder (MDD)	None			Age	1.33	0.056

Multivariate logistic regression was used to assess the association of each depression symptom, MDE, and MDD (as the outcome variable) with the following independent variables or factors entered into the initial model in each regression: age, gender, cannabis dependence, alcohol dependence, heavy substance use, and early conduct disorder. Final logistic models were determined using the Backward Stepwise approach of Wald.

* Factors in this column are those independent variables from the initial model which appeared in the final logistic regression model in each analysis. Alpha was set at 0.05, and p-values < 0.05 were considered significant.